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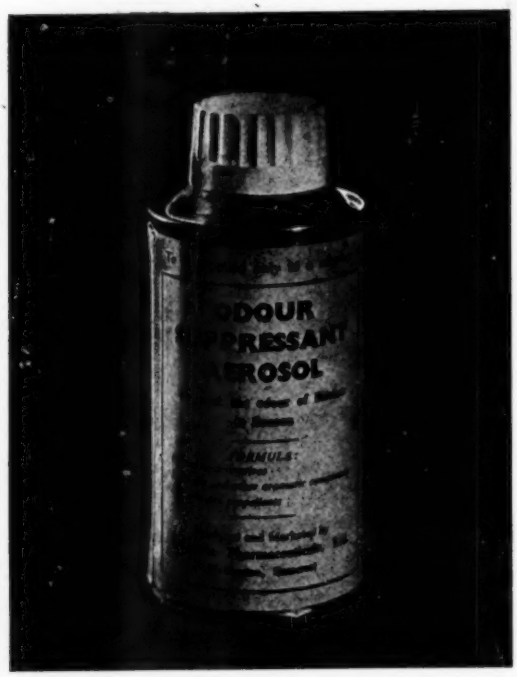

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The Prospect Before Us *

BY

WM. C. MILLER

Equine Research Station, Newmarket

FIRST of all, I would like to put on record my appreciation of the way in which all the members of the Eastern Counties Veterinary Society rallied round and supported the Annual B.V.A. Congress at Cambridge in August last year. It is no exaggeration to say that it was at least one of, if not *the*, most successful Congress the B.V.A. has ever held. That is just cause for satisfaction and self-congratulation for the E.C.V.S., and in saying this we can do so without any risk that we might lose our normal modicum of modesty. I must say again, possibly for the last time, how much we all owe to Dr. Peter Storie Pugh, as local secretary, for the great deal of hard work he and his staff put into the work of running the Congress. It was largely a personal triumph for him.

Second, I would like to put upon record the debt the Society owes to quite a number of people: to a number of extant Past-Presidents; to Mr. Low, who raised the money; and, perhaps in particular, to Mr. Murphy, who spent much time and trouble, and who exercised his artistic gifts to such good purpose that in 1957 the Society achieved the distinction of possessing its own President's Insignia of Office in the form of the Jewel which I have had the honour of wearing for the first time during the past year. Not many Divisions of the B.V.A. possess Insignia of Office, and none, I am confident, possess a Jewel which is superior to ours in design, beauty, or local significance. There is a move for the establishment of a chain of office to support it, each successive President contributing a link to commemorate his tenure of office. In this sort of way are traditions established for the future, and thus is the Society's history and stability built up for the inspiration and encouragement of future generations of those who will succeed us as members of the Eastern Counties Veterinary Society.

This much is, perhaps, of only parochial moment, but I do not think we should ever forget that the stronger are the local links in the Divisional chain that forms the British Veterinary Association, the stronger and more effective will be the whole; and every B.V.A. member in the home country and overseas should do everything possible to support and strengthen his own local Division, by attending, speaking, and contributing in every way he can.

The Agricultural Position

Now, perhaps, I may turn for a moment to some wider issues. I suppose that one of the foremost thoughts we have at present is some degree of concern for the present and future economic prospects of agriculture. It is impossible to view the signs of the times without some feelings of disturbance. I would be the last person, I hope, to be a Cassandra or a " dismal jimmie " where agriculture is concerned, but it is necessary to be a realist. It is fair comment to say that there must be something fundamentally wrong in the balance and structure of a society, when one vital section—agriculture—which is one of the most technically efficient in the world, is unable to survive without artificial monetary transfusions in the form of high subsidies. We all know cases where an organism requires transfusion to tide it over a crisis and to ensure its survival, but, biologically speaking, cases where *repeated* transfusions of ever-increasing magnitude are essential, are not cases to be viewed with equanimity. It is difficult to assess

* Abridged version of a Presidential Address to the Eastern Counties Veterinary Society, February 18th, 1958.

how much, relatively, cash crop production requires subsidised assistance and how much the production of animal products must be assisted. This much is, however, perfectly clear: milk is being over-produced by amounts of the order of about 150 million gallons yearly; eggs are in a similar category, while some of our food-exporting countries overseas—New Zealand and Australia—are beginning to complain that we are not buying enough meat from them because of our increasing home-production. In all this, the efficiency of the veterinary profession has played and is playing a very important part, which no one can belittle.

If one adopts a really hard and realistic attitude to the subject of British agricultural production, divorced entirely from sentiment, what are the facts? Many areas of the world's surface are better suited than Britain to produce the staple cereal foodstuffs in the quantities needed to feed our 54 million-odd mouths; better suited because of more favourable climate, suitability of soil, lower land values, lower wage levels, and so on. Transport facilities to-day are more capable of handling the tonnages involved at economic charges. Realistically, therefore, should we continue producing the "bread grains"?

The world's sugar-cane crops could supply us with all our sugar, and to the consumer the British sugar-beet crop is not really vital in times of peace. Potatoes are somewhat similar to other vegetables grown for home consumption, in that we can normally satisfy our own needs for the main crops without importations. Perhaps, realistically, we should continue to produce our own. It does seem, however, that if home agriculture has "to stand on its own feet" and face world competition for bulk and price, the British human population could quite well get all, or most, of its carbohydrates—breads, starches, and sugars—from overseas at equal or lower prices.

What about the other foods? Milk and butter are perishable commodities which must and can be produced at home, especially milk; eggs and table poultry also. Beef, pork, and mutton could each be bought from overseas and imported more cheaply than if produced at home. Wool, hides, and skins, and the various carcase by-products could either be imported or substituted by synthetic fibres, plastics, or synthetic compounds. Under such hard and realistic conditions there is little doubt that much quality would be sacrificed, but quantity and versatility could be relied upon, short of far-reaching political disturbances.

Thus, it would seem that in the last analysis, British agriculture might only be essentially concerned with the production of milk, poultry, potatoes, and other vegetables, which is a very sobering thought, and let us all hope it will never come to that.

What then is left? What other contribution might British agriculture make to the welfare of the nation and to progress in the world as a whole? Traditionally, Britain has been "the stud farm of the world," and during the last 100 years or more it has done more to populate with domesticated animals the extensive grazing areas of the earth than any other country. Where do we stand to-day as the chief supply centre for breeding stock, and where shall we stand to-morrow? I find these questions very difficult to answer; indeed I doubt if there is an answer. I will return to this consideration later.

I do not think for a moment that (a) we could afford to pay for practically 9/10ths of our food requirements—as we should have to if the above realistic approach became implemented by legislation or political manoeuvre; or that (b) there is any political party or series of parties which would dare to reduce an industry worth over £1,000,000,000 annually to the meagre levels outlined; or that (c) the British public would be prepared to allow a life-blood industry thus to be sacrificed.

There is, however, a certain amount of stiffening of public opinion against the continued payment of large food subsidies to agricultural producers and I anticipate, as the years go by, that British agriculture will find it more and more necessary to produce so as to sell its primary products in closer consonance with world price levels in the home market.

The Profession's Part

What part will the veterinary profession play in future? Efficiency in the production and improvements in the quantity and quality of all agricultural products will have to be brought higher and higher. Streamlining of methods, greater use of mechanisation, systems of self-housing, self-feed, and self-management, and the use of automation methods are coming in and will be further intensified to cut down costs. Almost certainly mistakes will be made (and have already been made) in some of these newer systems. The mechanical engineer and the engineering-minded farmer do not always remember and appreciate that in animals they are dealing with unpredictable living organisms, subject to the hazards of disease and ill-health, when basic criteria are neglected. The more complete control man takes of any animal's feeding and environment, the more perfect must the feeding and management systems be, if they are to be successful. We still know really awfully little of the complex mechanisms which are involved in the details of growth, fattening, and reproduction in the domesticated animals; or perhaps I should say—there is still an awful lot to be learnt.

Throughout the whole range of animal production our profession has, and will have, its vital part to play. Every disease outbreak prevented or controlled, and every animal successfully treated, is going to contribute its share in helping to ensure the continuance of British agriculture. There will be hard and challenging times ahead for most farmers and their veterinary advisers, if one reads the signs of the times correctly; for their "fat years" are coming to an end, and partly, but not wholly, there is a relationship between agricultural and veterinary practice; their fortunes ebb and flow in some degree of harmony.

I would suggest that in the fields of disease control, in therapy, and surgical and other skills, the veterinary profession to-day in Great Britain is playing a full and able part. Advances in knowledge coming

in a steady flow from research organisations of all types, are being incorporated into day-to-day practice with remarkable celerity, and treatment is becoming more and more efficient in all species of animals. In fact, in spite of the efforts being made at high levels to improve the position by adequate trials, sponsored independently, some of the newer agents are brought into routine use almost before their advantages and possible dangers are known; such is the speed of production and the degree of competition between the manufacturing houses.

I submit that where disease is concerned the profession has much of which to be proud to-day, when compared with even 20 years ago. I am, however, not quite so confident that as a profession we have adequately accepted the more positive tasks of advising on, and effecting wherever possible improvement in, the health of farm livestock. Much is already done in some practices, but I am convinced that much more could still be done. The old, badly-named "Survey Scheme" introduced as a war-time measure had some points of merit in it, which might well be re-examined to-day. The routine quarterly visits for general inspection and advice, paid for by contract on a *per capita* basis, did much to cement the mutual trust and general good relationship between client and veterinary surgeon. The latter, by observing progress, improvements, and benefits on the better-managed farms, found that he absorbed much new knowledge of this or that method of feeding or management. He was able to build up an enlarged experience, to form a good judgment, and was in a better position to pass on to his less successful clients advice and information gained from the wider knowledge thus acquired, after suitable adjustment or modification to suit particular conditions. I fully appreciate that in many practices a somewhat similar system of advice is still carried out, but I think the modern tendencies are to leave much of these general advisory services to such organisations as the V.I.O. services—with which I have no quarrel, or to the N.A.A.S. people—which is not at all the same thing.

Overseas Animal Production and the Future of the Export Trade

If we take a look at typical overseas animal-producing countries, we find an interesting series of facts which need consideration. In some countries—the U.S.A., Canada, New Zealand, and Australasia in particular—the era of massive importations of livestock from Britain is passing, or has passed. In these countries for a variety of reasons, among which improved methods of breeding and feeding and the development of increasing knowledge of the "know-how" by stockmen are important ingredients, the standards of production on the best establishments are high, sometimes as high as in Britain. They have at least partly overcome the progressive deterioration in improved imported stock which beset them earlier, and in consequence they are becoming more self-sufficient and do not need to import such a constant flow of high-quality and high-priced sires as they did in years gone by. The outlet for our pedigree stock to them has lessened, though it is still of great importance.

In other countries, perhaps the Argentine and other South American countries might be remembered, progressive deterioration still occurs in imported stock and their progeny, and constant importations are still needed if standards are to be maintained or improved. There is still an export market for good stock and this will continue, short of political upheavals—which no one can foresee.

It does seem, however, that in these countries overseas which still import livestock, as knowledge advances, as standards of living and education increase and improve, there can be expected for the future an improvement in the quantity and quality of livestock and their products which might well lead to a further reduction of imports from Britain.

Then there present themselves for consideration those areas which are more slowly achieving that type of political consciousness which usually precedes the recognition of the need for improvement. The areas still left with a huge potential as future livestock producers each present peculiarities—some natural, some man-made. Vast areas of tropical Africa have a high livestock production potential, provided certain criteria are fulfilled. These in order of importance are probably:—

(1) Conservation of water supplies and their proper utilisation.

(2) Conservation of animal health and the control of both epizootic and locally indigenous sporadic disease.

(3) Conservation of food supplies and their better utilisation, including improved animal nutrition.

(4) Improvements in the education and knowledge of the indigenous peoples.

(5) Organisation of supplies, services, and marketing arrangements.

This is a very extensive programme, and cannot be hastened. Great steps are already being taken, and much progress—some of it remarkable—has already been made in many areas. It has to be remembered that not for many years to come can any great volume of exportable surplus of meat or animal products be expected from them. Their first objectives will be to meet the increasing demands for local consumption, stimulated here and there by local industrialisation—mining, etc.—and the better wages paid for labour.

I think the time will come, when mastery of the local handicaps has been gained, when a demand for superior breeding stock will increase (it has already been started in countries such as Kenya, Tanganyika, etc.), and it will be for the home country to play its part in meeting that demand.

There are large areas of the Middle Eastern countries where livestock production could be greatly increased. The vigour and energy shown by Israel in the last 8 or 10 years shows what is capable of being achieved in this connexion, and there seems no real reason why much the same methods could not be equally successful in far greater areas. At

present some countries, wealthy for the first time in their histories from oil, are just commencing to make improvements, often with technical help from F.A.O., etc., in agricultural and livestock production. The logical developments which can be expected should lead to demands for improved stock.

Then there is a vast area of the world's surface in the Far East where animal production by Western standards is poor or very poor. To the majority of us, China to-day is very largely unknown in so far as local conditions are concerned. From such reports, however, as are available, there is a really tremendous field for expansion in animal production, and there can be no doubt that in time a demand will come for stock from Britain for export to China just as it has come, and is coming, from Russia.

So long as Britain maintains superior quality, good versatility, adequate diversity of type, and high standards of excellence in her pure-bred herds and flocks, we can have every confidence that our farm animals will remain in demand, to help to populate yet more areas of the world.

The Challenge to Small-animal Veterinary Practice

During recent years there has been much talk about the potential harm that may accrue to small-animal veterinary practices from the activities of certain organisations whose methods are sometimes open to criticism. There is a challenge in this threat to the small-animal veterinary surgeon. How is it being met?

I would like to state quite categorically that I think the real dangers are much less than those implied. There has been a quiet revolution in methods of treatment, both surgical and medical, of diseases of small animals in the last two decades. Small-animal therapy is now far more scientific and efficient than ever it was. The lay person has no hope of competing successfully with the trained veterinary surgeon of to-day or to-morrow, if, indeed, he ever had such a hope. Five years of intensive training on the one hand, against a short smattering of some few simple techniques on the other! Need there be cause for alarm? I think not, and a brief scrutiny of the advertisement columns of THE RECORD does much to convince me I am right. Out of 162 recent advertisements for assistants in veterinary practices, 34 were from "small-animal" practices; 73 were from "mixed practices" and 31 were from "agricultural practices." The rest, 24, were unspecified. It would be permissible to suggest that perhaps one quarter of the work of mixed practices is concerned with small animals, so that taking the demand made by the profession for recruitment of assistants for work with small animals as a sort of index, it would seem that there is a sufficient demand for small-animal workers to account for somewhere about one-third of the advertisements during recent weeks (52 out of 162). Obviously, this demand for assistants for work among small animals would not arise if the small animals and the professional work with them either did not exist, or was leaving the profession and passing into the hands of the various bodies to which allusion has been made. I suggest that, irritating and annoying though the work of these bodies may be to individuals or groups of individuals, there need be no cause for dismay or alarm for the future. The challenge has been met, and provided the profession maintains its standards and efficiency, it will continue to be met very effectively.

The Changing Pattern of Disease

Looking back a few years, it is interesting to note the changing pattern of disease in all farm animals, but in cattle in particular.

In the 1920's, the great bovine scourges were tuberculosis, contagious bovine abortion, Jöhne's disease, and mastitis. Of lesser importance was parasitic bronchitis, confined then to young stock only, a mild degree of infertility, and much "stomach staggers" and "hoven" or "blown." Trichomoniasis was not recognised in Britain, though early reports had come from the Continent. Vibriosis was quite unheard of, and probably did not then exist in our dairy cattle. Hypocalcaemia in heavy milking cows was known, but was almost 100 per cent. controllable by udder inflation. The other metabolic diseases were at least very rare, if they occurred at all. There was certainly nothing like the dramatic outbreaks of hypomagnesaemia or acetonaemia, with which we have all become familiar. A whole group of perhaps less common conditions has been brought to light since then: conditions such as hypocupraemia, fluorosis, coccidiosis, contagious ophthalmia, viral infertility, and, more recently, the mucosal disease complexes. In the majority of these, causes have been elucidated and reasonable control measures have been applied, and though complete control has not yet been achieved for all, work continues.

The story is much the same with sheep, pigs, and poultry. Many diseases and ailments common 30 to 40 years ago are rare to-day or have disappeared, while others, then unknown or unrecognised, are present to-day.

The Future

Looking forward to the next 30 years, it is tempting to speculate what the future holds. Someone has said that an examination of past history is a necessary step to understanding the present and predicting the future. If this applies to our own work, then I expect we can anticipate that other new conditions, previously unknown, will develop, and after periods of uncertainty, investigation will elucidate the causes and further work will enable means of control or prevention to be devised.

It is consequently in a hopeful and sanguine way that we can look forward to the future. New conditions can to-day be much more rapidly recognised in veterinary practice, and after recognition the wheels of investigation and research can be put in motion with greater speed and efficiency than ever before in the history of our profession. This is a very commendable state of affairs, and one of which we can all be justly proud. Everyone has his own part to play, even though at the time the fact that he is an essential cog in a very considerable mass of machinery, may well be forgotten.

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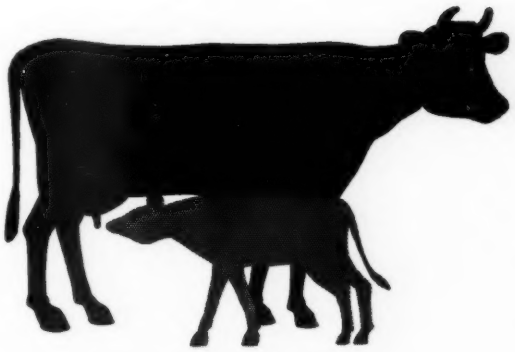

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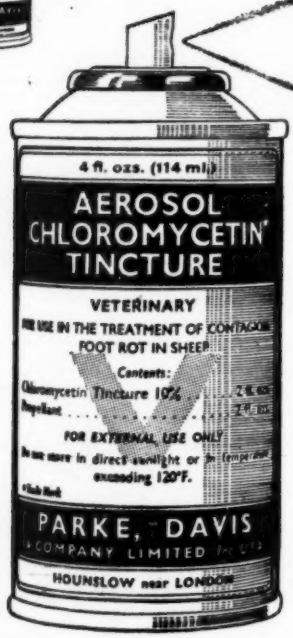

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Coccidiosis in Turkeys

BY

M. J. CLARKSON* and MOYA A. GENTLES

Department of Veterinary Preventive Medicine, University of Liverpool

SUMMARY.—Coccidiosis in turkeys is briefly reviewed, and its occurrence in Great Britain discussed. The two species of importance identified in this country so far by the authors are E. adenoeides *and* E. meleagrimitis. *The features of these species and of experimental infections in turkey poults are described. The two species can be distinguished by the site and nature of the lesions, together with the dimensions and character of oocysts. The lesions are produced by the sexual stages.*

In the field, two distinct forms of coccidiosis, very similar to the experimental diseases, were recognised. Losses occur most often in birds 2 to 3 weeks old, kept in solid-floor brooders. The symptoms, course of infection, and diagnosis are described. Treatment with sulphaquinoxaline appeared to be effective.

Introduction

COCCIDIOSIS in turkeys does not seem to have been of great importance until recent years. The higher incidence to-day is possibly due to the intensive methods which have been introduced and the rapid growth of the turkey industry.

Tyzzer (1929) in a series of experiments using *Eimeria meleagridis* and *Eimeria meleagrimitis* produced only two deaths, both due to the latter species. He found only one field case in which the lesions were indicative of coccidiosis, and concluded that it was not an important disease in New England.

At the end of the Second World War it was realised that coccidiosis was becoming an important problem on many of the large turkey farms in the U.S.A. (Moore, 1947), although Morehouse (1949) found that mortality in field outbreaks was only 2 per cent., whereas under experimental conditions it was 100 per cent. with *E. meleagrimitis* and 6.3 per cent. with *E. meleagridis*. Hawkins (1949, 1952) recorded that *E. meleagrimitis* was the only species which had serious effects on the turkey; it could produce 100 per cent. mortality in birds 2 to 3 weeks old. He also studied the effect on weight gain and food consumption of infection with the three species of coccidia which were then known in turkeys, the two species above, and *E. dispersa*. Hawkins also described a new species in the turkey, *E. gallopavonis*, but carried out no experiments to study its effect on the host.

All workers agree with regard to the pathogenicity of *E. meleagrimitis*. The conflicting results with *E. meleagridis* were to some extent explained when Moore and Brown (1951) described *E. adenoeides*, a new species pathogenic in young poults and producing oocysts indistinguishable from those of *E. meleagridis*. Since Morehouse did not use a pure species derived from a single oocyst he may have unknowingly used a mixed culture in his experiments on *E. meleagridis*, and so the mortality which resulted may have been due to *E. adenoeides*. Two further species of Eimeria, *E. innocua* (Moore & Brown, 1952) and *E. subrotunda* (Moore, Brown & Carter, 1953), have been described in the United States, both species being non-pathogenic, thus making 7 species altogether.

In Great Britain little has been published on coccidiosis in turkeys. and the species involved in natural outbreaks have not been determined with certainty.

Wilson (1951), describing the control of a field outbreak of coccidiosis by the use of sulphaquinoxaline, attributed it to *E. meleagridis* and *E. meleagrimitis*, although he did not describe the lesions or the characters of the oocysts.

Gordon (1955) suggested that *E. adenoeides* is the species probably causing a high mortality in turkeys and that the whole field of turkey coccidiosis required re-investigation following the discovery in 1951 of this new species of Eimeria.

Ford (1956) described coccidiosis as a serious cause of losses on 3 turkey farms. Deaths occurred at all ages up to 3 months, and especially at 10 to 12 weeks. On the basis of oocyst measurements he considered, as did Wilson (1951), that the outbreaks were caused by *E. meleagridis* and *E. meleagrimitis*. The site of the lesions was most commonly the lower small intestine, but they also involved the large intestine and caeca.

De Gruchy (1956) found coccidiosis to be an important disease in turkey poults on one large farm, the lesions occurring in the intestine or caeca, or in both sites. The species of coccidia involved were not identified. The age range was 1 to 9 weeks, though most losses occurred in the 3 to 4 weeks period (personal communication).

There is only one reference to experimental coccidiosis in poults in this country, a brief note on "suspected *E. adenoeides*" (Horton-Smith & Long, 1956) in a paper on the control of histomoniasis by furazolidone.

There is thus a need both to study the effect of experimental infection of turkey poults by single species of coccidia in order to discover their relative pathogenicity and also to identify the species involved in field outbreaks.

In this paper the experimental pathogenicity and pathology of infections with pure strains of *E. adenoeides* and *E. meleagrimitis* are described briefly,† and field outbreaks of coccidiosis are discussed in the light of the experimental data.

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† Full details are given elsewhere (Clarkson, 1957), or will be published later.

The Experimental Disease

The methods used to isolate and maintain pure strains of Eimeria have been described previously (Clarkson, 1956). Briefly they consist of infection with a single oocyst isolated with a micromanipulator and maintenance of coccidia-free poults. The detailed protozoology will be described elsewhere.

E. adenoeides

The oocysts are ellipsoidal, measuring 25.60 × 16.25 μ (range 21.50 — 30.00 μ × 13.50 — 19.75 μ), and contain a refractile granule when sporulated. At 26° C. they sporulate in under 24 hours, and the prepatent period (time between dosing and appearance of first oocysts in the faeces) is 5 days.

Symptoms. Infected poults behave normally until the end of the 4th day. They then cease feeding but continue to drink, huddle under the heat and cheep, and their feathers are ruffled. The faeces become liquid and contain orange-coloured mucus and large numbers of merozoites, but only small amounts of blood. On the 6th day solid, whitish cores of oocysts are passed. Deaths occur late on the 5th day and continue to the 7th day.

Lesions. Since *E. adenoeides* is confined to the terminal small intestine, caeca, and rectum, lesions are restricted to these regions. The blood vessels are congested and stand out distinctly against the contents of the unopened intestine and there are often petechiae. On opening the intestine a yellow-white mucoid material consisting of oocysts and epithelial debris and occasionally tinged with blood is seen extending from the rectum almost as far anteriorly as the rudimentary yolk stalk. The caeca may contain hard necrotic casts or their contents may be normal, apart from small, cheese-like clots. Sections show congestion of the mucosa and infiltration with eosinophilic leucocytes and small, round cells. Large numbers of developing gametocytes are seen in the epithelial cells of the villi and extending into the deep glands. The tips of the villi are often denuded of epithelium, but rupture of blood vessels is uncommon.

TABLE I

PATHOGENICITY OF *E. Adenoeides* AND *E. Meleagrimitis* FOR TURKEY POULTS

Age (weeks)	*E. adenoeides*		*E. meleagrimitis*	
	Dose*	Mortality†	Dose*	Mortality†
1–2	100,000	14/14	100,000	5/8
3	100,000	9/20	100,000	6/12
	200,000	12/12	200,000	4/6
4	—	—	300,000	4/5
			400,000	3/3
5	—	—	1×10^6	1/5
6	1×10^6	2/6	—	—
9	2×10^6	0/2	2×10^6	0/4
11	3×10^6	0/3	—	—

* No. of sporulated oocysts.

† Numerator—deaths.

Denominator—total dosed.

Pathogenicity. Mortality up to 100 per cent. occurs in birds 3 weeks old (Table I). Age resistance develops rapidly and massive doses will not kill birds 9 weeks old. Non-fatal infection also causes loss in weight, but this is only transitory and weight gains soon become normal once the acute phase of the disease is past.

E. meleagrimitis

Oocysts are subspherical, measuring 20.09 μ × 17.33 μ (range 16.00 — 25.50 μ × 13.75 —22.00 μ). They sporulate at 26° C. in 24 hours and then contain a refractile granule. The prepatent period is just under 5 days.

Symptoms. The symptoms are the same as those caused by *E. adenoeides* except that the faeces on the 6th day do not consist almost entirely of oocysts but of a foul-smelling, dark brown liquid material containing small streaks of dark blood. The faeces may also contain pieces of mucosa full of gametocytes, along with oocysts and a variety of other stages in development of the parasite, as well as much cellular debris. After the 6th day the birds become dehydrated and lose condition much more than with *E. adenoeides*, and there is often the impression of a chronic wasting disease. Deaths occur between the 6th and 8th days after infection.

Lesions. Birds are usually dehydrated and in poor condition, though poults dying on the 6th day from infection may be in good condition. The site of infection is primarily the duodenum and upper intestine. The former is enlarged and oedematous, and shows congestion. In a fresh carcase the lumen contains a red-brown necrotic core adherent to the mucosa and extending throughout the duodenum and into the first inch or so of the small intestine. This material may pass along the intestine by peristalsis and be found in the lower small intestine. It contains enormous numbers of oocysts as well as blood and necrotic cells.

In a bird which has been dead a few hours rapid liquefaction of the duodenal contents occurs and a foul-smelling, bloodstained, red-brown material is found in the duodenum and first part of the intestine. This is the usual picture seen in field outbreaks where carcases are not usually examined for some time after death. Microscopic examination of this material will confirm the diagnosis.

Microscopically, the tips of the villi are disrupted by the sexual stages of the parasite, and so the necrotic material in the lumen is composed of dead tissue cells, blood cells, stages of the parasite, and bacteria.

Pathogenicity. A high mortality occurs in young poults (Table I). Although age resistance develops early, reduction in weight gain occurs with previously uninfected birds of all ages and can cause serious economic loss.

Treatment. Preliminary experiments indicate that sulphaquinoxaline is effective in preventing mortality caused by *E. adenoeides* infection but we have not yet investigated the drug susceptibility of *E. meleagrimitis* infection.

The Natural Disease

Over the past two seasons (1956, 1957) 22 field outbreaks on 4 farms and involving some 2,000 poults have been investigated. Although not all the birds which died were received for examination, certain facts emerge from these investigations.

Age Range. The youngest affected poult examined was 10 days old, the oldest 5½ weeks; the majority were 2 to 3 weeks old.

Management. Most cases occurred in solid-floor brooders in the form of sheds, stables, loose-boxes, etc., with peat moss, sawdust, or shavings for litter. Cases were also seen in "Motley" houses, which, although having wire floors, also have a large solid area over the paraffin lamp on which the poults spend much of their time.

Course of infection. All outbreaks were treated (details below) as soon as the disease was diagnosed and it is not known what the mortality would otherwise have been. Losses averaged 15 per cent. (range 5 to 25 per cent.) and mortality ceased 3 days after beginning of drug therapy.

Symptoms. There were no specific symptoms. Birds were usually found dead and others could then be seen to be sick. Sometimes, in individual birds, the droppings showed shreds of mucosa (as seen in experimental infection with *E. meleagrimitis*) or casts of oocysts (as in experimental infection with *E. adenoides*) but blood was not usually present.

Diagnosis. Coccidiosis was suspected when birds up to 6 weeks and especially 2 to 3 weeks old were found dead, particularly if they had been reared in solid-floor brooders. On *post-mortem* examination lesions corresponding to those seen in the two experimental diseases were found. In 15 outbreaks the lesions occurred in the terminal small intestine, caeca, and rectum and were identical with those described for experimental infection with *E. adenoeides*. It would seem highly probable that this was the species responsible for these outbreaks since *E. meleagridis* and *E. gallopavonis*, the other species which occur in these sites and have similar oocysts, are less pathogenic and do not invade the deep glands (Table II).

In 4 outbreaks the lesions were identical with those described for experimental infection with *E. meleagrimitis*, being particularly severe in the duodenum. The other species which occur in this region, *E. dispersa*, *E. innocua*, and *E. subrotunda*, are non-pathogenic and do not contain a refractile granule after sporulation (Table II). This evidence strongly suggests that *E. meleagrimitis* was the species responsible for these 4 outbreaks.

In 3 outbreaks lesions were found in both duodenum and lower intestine, caeca and rectum, suggesting a mixed infection with *E. adenoeides* and *E. meleagrimitis*.

As these lesions are so similar to those produced by pure strains of *E. adenoeides* and *E. meleagrimitis*, it seems highly probable that these species were mainly responsible for the field outbreaks which we investigated, though work on the other species described in America may show that they too can cause losses in the field.

Treatment. As soon as the first case was diagnosed the birds were given 0.05 per cent. sulphaquinoxaline solution in place of drinking water using an interrupted schedule as for *E. tenella* of 3 days on drug, 2 days on ordinary water, and then a further 3 days on drug. Sulphaquinoxaline was used because turkeys will not drink sulphadimidine medicated water (Wilson, 1951).

Discussion

By the use of known pure strains of two species of Eimeria it has been clearly shown that there are two distinct forms of experimental coccidiosis in turkey poults.

In field outbreaks of coccidiosis there are also two forms, which are very similar to the experimental diseases and can be distinguished by the location and type of lesions and by oocyst measurements. This procedure can be relatively easily carried out in routine *post-mortem* examination and thus the incidence of the two forms of coccidiosis determined.

In experimental infections with either *E. adenoeides* or *E. meleagrimitis* we were unable to kill birds over

TABLE II
CHARACTERISTICS OF EIMERIA SPECIES IN THE TURKEY *

Localisation in the intestine	Species	Oocyst			Pathogenicity
		Shape	Average length and width (μ)	Refractile granule after sporulation	
Mainly duodenum, jejunum and upper ileum	*E. meleagrimitis*	Sub-spherical	20.09 × 17.33	Present	Pathogenic
	E. dispersa	ovoid	26.07 × 21.04	Absent	Relatively non-pathogenic
	E. innocua	Sub-spherical	22.41 × 20.86	Absent	Relatively non-pathogenic
	E. subrotunda	Sub-spherical	21.77 × 19.81	Absent	Relatively non-pathogenic
Mainly lower ileum, caeca and rectum. *E. adenoeides* is the only species whose gametocytes develop in the deep glands as well as the tips of the villi	*E. meleagridis*	Ellipsoidal	24.4 × 18.1	Present	Relatively non-pathogenic
	E. gallopavonis	Ellipsoidal	27.1 × 17.2	Present	Not determined
	E. adenoeides	Ellipsoidal	25.60 × 16.25	Present	Pathogenic

* From present work and Moore *et al.* (1953).

6 weeks old. This differs from experience with *E. tenella* (Horton-Smith, 1947) and *E. necatrix* (Davies, 1956), where resistance to disease depends largely on previous infection, and where there is no true age resistance. Coccidiosis caused by these species should thus cause little trouble if birds are reared on wire-floored brooders until 8 weeks of age and then placed in yards or on solid floors. The age incidence in field outbreaks agrees with the experimental data. Ford (1956), on the other hand, has reported several cases in birds of 10 to 12 weeks, which suggests either that other species of Eimeria with different age resistance may be concerned, or that subsidiary environmental factors may affect the resistance of poults to coccidiosis.

The pathogenic effect of both species of Eimeria is associated with the development of sexual stages in the intestine rather than, as with *E. tenella* or *E. necatrix*, with the second-stage schizont. This means that diagnosis can be made by finding large numbers of oocysts or gametocytes in the intestinal contents rather than schizonts and merozoites. In coccidiosis in chicks, particularly in the acute caecal type, blood is often present in large amounts in the faeces, due to rupture of the second-stage schizont through the mucosa from the submucosa. This does not occur in turkey coccidiosis, and so blood is less often seen in the faeces, and then only in small amounts.

Since there are at least two species of Eimeria which can cause disease in poults and since resistance is species specific it is possible for one group of poults to have two or more attacks of the disease. We have never met this in the field, probably because oocysts of both species are usually present together in the litter and thus resistance to both species develops at the same time. It has been possible experimentally, however, to produce disease in the same group of poults on two successive occasions. Four birds 10 days old were given 100,000 oocysts of *E. meleagrimitis*; one died 6 days later. The other 3 were very ill but recovered; a week later they were given 200,000 *E. adenoeides*, and all 3 died on the 6th day.

In our experience sulphaquinoxaline is very effective in the treatment of established outbreaks of coccidiosis and this has been confirmed by preliminary experiments on *E. adenoeides*, which are still in progress.

Acknowledgments.—We should like to thank Professor E. G. White for his supervision and interest throughout this work and for his help in the preparation of the paper.

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Prolapse of the Rectum in the Pig

BY

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SUMMARY.—The condition of prolapse of the rectum and the local anatomy of the pig is described.

Aetiology is discussed, and a possible connexion with intensive management is suggested.

A method of surgical correction is described.

PROLAPSE of the rectum in the store pig seems to have received very little attention in veterinary literature. Lynch (1914), Kinsly (1921), and Anthony (1955) all mention the condition but do not seem to regard it as being of economic importance.

The occurrence of some 40 cases over a period of 2 years in a practice in which pigs have no special predominance, forming only part of general mixed farming, seemed to warrant some investigation as to the possible cause of the condition.

Definition

The condition under discussion is that which occurs in the store pig (usually between 8 and 16 weeks of age) and has no relation to the condition seen in sows which is linked with oestrus and parturition. The condition as seen in this practice is limited in extent, varying in length from 2 to 4 inches.

Anatomy

Sisson (1938) describes the attachments of the rectum as being in two parts. Anteriorly, it is covered by peritoneum reflected from the dorsal aspect of the abdominal cavity to form the meso-rectum in complete continuity with the meso-colon. This structure is quite short and the posterior limit of reflection apparently varies with the degree of distension of the rectum. The limits are those of the sacrum on the dorsal aspect.

Posteriorly, the attachment is simple connective tissue incorporating various amounts of fat which is dependent on the condition of the animal. The mechanics of the prolapse involve a sudden breakdown of this connective tissue, anchorage by the short meso-rectum giving the relatively constant degree of the prolapse.

The pigman of the herd which suffered the largest number of cases suggested that the condition must

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be instantaneously produced as he had never seen any intermediate stages. This suggestion was confirmed by personal observation.

Aetiology

The aetiology is perhaps the most interesting aspect of the condition. Anthony, Kinsly, and Lynch in their various works dispose of the condition as occurring during scouring or constipation by reason of the increased frequency of defaecation reflexes and inflammation of the rectal mucosa. The apparent normality of faecal material in the great majority of cases in the present series, however, was impressive, and only one case occurred in 4 sizeable herds in the practice where scouring was a problem. All the cases occurred in pigs of the Large White breed or crosses thereof, but this probably has no significance as this breed is in the majority in this area.

Of this series, 10 cases formed the largest number which was recorded in an individual herd. These cases also provided the most interesting information on investigation as 9 of the cases came from two litters of a single sow. The herd consisted of Large White and Large White cross Welsh sows, and Large White and Landrace boars. The sow involved was a Large White and she was mated in the first instance with the Large White boar. From one litter 3 out of 8 piglets suffered prolapse of the rectum at approximately 12 weeks of age. The sow was then mated to the Landrace boar and no cases appeared in the subsequent litter. Before this litter was born the feed was changed in an attempt to prevent any further cases.

For the following litter the sow was mated back to the Large White boar and 6 of the 8 piglets in this litter suffered prolapse of the rectum within a week. There had been no further change of food, nor was there any over-crowding, scouring, or constipation in the herd. Management was of a high order, and there had been only one other case of prolapsed rectum in the herd: other contributory factors, therefore, can be ruled out. This would seem to lead to one conclusion—that hereditary factors are involved in these cases. It is not suggested that there is a gene carrying this factor, but it does seem possible to breed a line of pigs with increased susceptibility to the condition. It would perhaps be better to speak of reduced resistance to rapid throughput of food material, but which ever way it is phrased the condition is due presumably to decreased strength of the extra-peritoneal connective tissue attachments of the rectum.

Of the remaining cases, 7 was the highest number encountered from one herd and formed the only other group from which it was possible to draw any conclusions. All the pigs were bought as stores from widespread sources, and since there were no other obvious causal factors for the appearance of the condition it was decided to try the effect of a change of food from one proprietary brand to another. This experiment was almost completely successful, 6 cases having occurred in the previous 3 months and only one since that date. Unfortunately, comparative analyses of food were not available.

The remaining cases occurred in isolation throughout the practice and mostly in flying fattener herds from which it was not possible to draw any conclusions. It seems significant, however, that 38 of the 40 cases were from herds in which management is intensive and that only 2 came from herds where the pigs fatten in spite of their owners.

Growth rate at 8 to 16 weeks is high and the food intake is relatively large since the pigs have completed their transfer and adjustment to a fattening-meal diet. It would seem, therefore, that the condition reported here is more a hazard of modern intensive pig farming than a result of pathological change as has previously been supposed.

Treatment

Choice of treatment seems to lie between mere replacement with retention sutures and surgical correction of a radical nature. Very poor results have been obtained with the former, even in cases where trauma has not occurred. and simple amputation and suturing have not been performed owing to the risk of peritonitis. Good results have been obtained by the operation of mucous membrane resection, success being achieved in 95 per cent. of the cases.

Anaesthesia is by far the most difficult part of the operation. In this practice general anaesthesia has been induced by means of pentobarbitone sodium*. Shorter surgical anaesthesia would be preferable but the high cost and the risk of cutaneous sloughing involved in the use of thiopentone sodium†, together with the risk of death in gaseous anaesthesia, have made the choice for us. Since this survey was carried out attention has been drawn to epidural anaesthesia in the pig (Larkin, 1956). The author has had no experience of this method but the operation of resection would seem to be a good indication for it. There is usually a major bifurcation of the marginal ear vein near its tip and if a No. 20 needle $\frac{5}{8}$ in. long is inserted at this point the pig rarely notices the entry of the needle, provided restraint is adequate. The fine bore of the needle which is of the type more usual in medical than in veterinary practice also precludes any hurrying of the anaesthesia. It has been found that dosage rate varies widely, the range being 1/5 to 1/15 gr. per pound bodyweight during the course of the present series.

The prolapse is washed and then transfixed with two needles inserted at right-angles and as close to the anal ring as possible. Asepsis is ignored. A circular incision is made $\frac{1}{4}$ in. from the anal ring. passing through mucous membrane only, and this is then reflected from the underlying musculature for the whole length of the prolapse and amputated at the lumen leaving a collar of healthy mucosa projecting (see diagrams 1 and 2 overleaf).

* Nembutal.
† Pentothal.

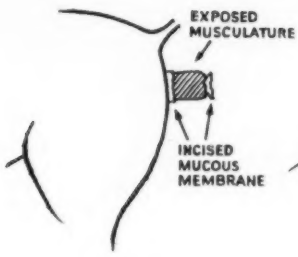

Diagram 1

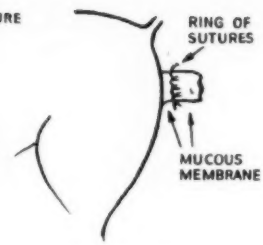

Diagram 2

The two incised edges of mucosa are then sutured together so that they are in apposition (8 sutures at the cardinal compass points are usually sufficient). The transfixing needles are removed, and frequently the prolapse corrects itself owing to the tension of the mucous membrane which also serves to prevent a recurrence of the condition. If correction does not occur the prolapse is gently replaced and, in any case, a purse-string suture is inserted lightly into the anal ring. Instructions are given to remove this after 48 to 72 hours.

So far as is known only one case has failed to recover—obstruction following stenosis which resulted in the death of the animal. A few cases have scoured temporarily but not one has suffered recurrence of the prolapse.

Finally, one case provided evidence for the theory that an intussusception may on occasion resolve by sloughing with survival of the animal. The author was called to see a pig which the owner said: "had something protruding from the anus." This proved to be shreds of muscle, attached just within the anal ring where a stenosis had occurred. It is presumed that the animal had had a prolapsed rectum which had not been noticed until necrosis and incomplete sloughing had occurred.

Acknowledgment.—I should like to thank Mr. D. W. Wood, B.SC., M.R.C.V.S., of Gloucester for permission to publish these observations.

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BOOKS RECEIVED

The following books have been received: *Difficult Dogs*, by Barbara Woodhouse (Faber & Faber, 10s. 6d.); *The Popular Collie*, by Margaret Osborne (Popular Dogs, 18s.); *Keeping a Dog on a Small Income* (Hutchinson & Co., 5s.); *The British National Formulary, 1957* (The Pharmaceutical Press, 10s.); *Agricultural Research Council Index, 1957* (Cambridge University Press, 12s. 6d.); and *A Zoo of my Own*, by Cornelius Conyn (Harrap & Co., 12s. 6d.).

Blood Volume Determinations in Horses Using Radioactive Phosphorus

BY

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SUMMARY.—The blood and erythrocyte volumes of 10 *horses, of one donkey, and one jennet were measured using the radioactive phosphorus technique of Reeve & Veall.*

The mean blood volume was 6.9 *ml. blood per* 100 *grammes bodyweight.*

The mean erythrocyte volume was 2.6 *ml. per* 100 *grammes bodyweight.*

Introduction

A PRECISE knowledge of the size of the different fluid compartments of the animal body is of ever-increasing importance. While a good deal of information is available for the human and for laboratory animals, the position is less satisfactory in regard to the farm animals. Apart from their intrinsic interest as basic dimensions of the animal body, important alike in physiological and pathological studies, exact information regarding blood and tissue fluid volumes is of increasing importance in field studies and modern transfusion therapy (McGeady & Bourke, 1953). Reliable figures for some of the farm animals have recently been worked out, but the dearth of information regarding the horse is striking. Even as regards the blood volume there is a lack of agreement between different authorities. The latest edition of "Dukes Physiology of the Domestic Animals" gives a figure of 9.7 ml. per 100 grammes bodyweight, while Hansard (1953) records a value of 6.2 ml. per 100 grammes bodyweight.

Until the advent of radioisotopic techniques the method of choice in measuring blood volume had been the dye dilution method using Evans Blue (T-1824). Courtice (1943) published determinations by this method on a group of animals including two horses. Cronin (1954) published figures using the same technique on one horse.

The introduction of the Reeve & Veall technique using high-activity P32 started a new era in blood determinations of the type under present consideration. Their method has been shown to yield reproducible results in man and several animals. It is largely free from the defects of the dye dilution method. It is quick, experimentally straightforward, and for the moment at least pre-eminent in this field.

Material

Ten horses, one donkey, and one jennet were used in this experiment. Details of their status are given in Table I. The Veall technique, with minor modifications, was followed throughout. The Geiger-Muller tube used was the M2H. This is shorter

+ See Errata - p. 292

TABLE I

Animal	Sex	Approximate age in years	Mass in kgs.	Blood volume in litres	Ml. of blood per 100 g. bodyweight	Haematocrit mean	Erythrocyte volume in ml. per 100 g. bodyweight
1. Skewbald pony	F	4	333	21.1	6.3	41.5	2.5
2. Thoroughbred	Gelding	10	557	40.5	7.3	44.0	3.1
3. Jennet	Gelding	20	219	14.8	6.8	32.0	2.3
4. Donkey	F	20	184	12.5	6.8	42.0	2.7
5. Black pony	F	7	180	12.1	6.7	38.5	2.5
6. Pony	F	1½	136	10.0	7.4	35.0	2.5
7. Black thoroughbred ...	F	5	532	37.8	7.1	42.5	2.9
8. Large working mare... ...	F	13	710	45.8	6.5	39.5	2.4
9. Black	Gelding	16	422	26.9	6.4	42.0	2.6
10. Chestnut pony	F	9	306	21.8	7.1	40.0	2.7
11. Large Hunter	Gelding	6	622	43.5	7.0	41.5	2.8
12. Pony	Gelding	12	280	19.3	6.9	41.0	2.7
				Mean	6.9	Mean	2.6

than the M6H used by Veall (1948), and has a capacity of only 3 to 4 ml.; otherwise it has the characteristics of the M6H. The difficulty of cleaning such a tube, and therefore, keeping down the background count with each successive run was minimised by first coating the inside of the tube with silicone. After this treatment, simple washing and rubbing with filter paper between runs kept the background within manageable dimensions. The initial background count with our tube was 11 counts per minute, and it did not exceed 30 c.p.m. during any effective run.

During the course of this work we also used a dipping tube, the B6H. This proved equally satisfactory, and it is easier to clean than the Veall tube, a point which would be of more importance were very high activity material being used. All the results given in this paper are, however, based on calculations made using the Veall tube, since this has proved an acceptable standard in other work of the kind by different workers (Reeve, 1952).

Method

In the case of each animal, 20 ml. of blood is withdrawn into test tubes containing Wintrobe's oxalate solution. Ten ml. of this is pipetted into a small vessel to which is added 1 ml. of P32 solution of an original activity of 1 mc. per ml. This quantity of isotope is still adequate even after the expiry of one half-life, *i.e.* 14 days approximately. The mixture of oxalated blood and isotope is incubated at 37° C. with agitation for 3 hours. During this process a proportion of the isotope becomes fixed in the erythrocytes. The solution is then spun at 3,000 r.p.m. for 30 minutes and the supernatant fluid carefully pipetted off. Three subsequent washings of ten minutes each in cold saline are carried out to ensure that no isotope is left except that fixed in the erythrocytes.

One ml. of these packed labelled erythrocytes is then taken and diluted with sodium tricitrate-Sorensen buffer phosphate solution (Reeve & Veall, 1949) to form a standard. One ml. of labelled erythrocytes is injected into the animal from which the blood was originally taken. This constitutes the critical injection.

Since it is essential for the validity of results that the volume of cells injected should be accurately known, the following procedure is adopted: a suitable area over the jugular vein is clipped, swabbed, and anaesthetised with 1 c.c. of procaine hydrochloride* distributed intra- and subcutaneously. After an interval of 10 minutes this gives adequate anaesthesia even in restless Thoroughbreds. A number 12 needle is then introduced into the vein and a polythene catheter 3 to 4 inches long passed into the vein through the lumen of the needle. Both are stabilised by forceps and 1 ml. of labelled cells injected. The injection is flushed in with two refills of saline to ensure clearance of syringe and catheter. The labelled erythrocytes are allowed 5 minutes for complete mixing in the animal body. Then the vein is again compressed, blood allowed to flow to avoid error through a possible local concentration of injectum, and a suitable volume of blood then collected. This is lysed with saponin and counted in a Veall tube without delay. Saponin is also used for the standard which is counted immediately after the test blood.

In order to estimate the erythrocyte volumes haematocrits are run on all bloods. Six Wintrobe tubes for each specimen are spun for 30 minutes at 3,000 r.p.m. through a radius of 15 cm.

Whole blood loses activity through passage of P32 from the erythrocyte into the plasma. Owing to variations in the handling of the different animals, and possibly to individual physiological variations as well, we found it impossible to produce any curve for general use. But on the basis of samples taken at periods of from 5 to 30 minutes after injection we were able to construct curves showing that loss of activity in our samples was of the order of 10 per cent. in the first 15 minutes and to use these curves to extrapolate back to zero in the calculation of our results.

Results and Calculations

Basically the calculation is one of simple proportion:—

* Rivocaine.

Let A = volume of washed packed cells injected;
Ci = count rate of this suspension;
Cii = count rate of blood withdrawn from animal.

Then
V = volume of circulating blood

$$= \frac{A \times Ci}{Cii}$$

Neither the washed suspension of erythrocytes nor the active sample withdrawn are counted directly. In fact, both Ci and Cii are calculations from the counts actually made, by allowing for the diluents employed and for the loss of P32 from the erythrocytes. The active blood was counted in a dilution of 1:1 or 1:2 The standard was used at a dilution comparable to that suffered by the injectum in the animal body.

In calculating the red-cell volume, we used the formula of Barnes, Loutit, and Reeve (1948):—

H = Ht × 0.95 where
H = erythrocyte volume
Ht = mean haematocrit reading.

This allows for the plasma trapped among the erythrocytes after centrifugalisation.

The main points of our results are set out in Table I.

Discussion

In spite of the wide variation of bodyweight and physical condition of our animals the haematocrit mean and erythrocyte volume fall within a reasonably narrow range. The highest haematocrit, and correspondingly, the highest erythrocyte volume per 100 grammes bodyweight were recorded from one of the Thoroughbred animals. The other Thoroughbred and a well-bred hunter were also well up in these figures. It is perhaps worth drawing attention to the fact that the erythrocyte volume per 100 grammes bodyweight appears better correlated with breeding than the haematocrit mean. This point was also brought out in studies of the blood values of the Thoroughbred and cold-blooded horse by Stewart and Holman (1940), McLeod *et al.* (1947-8), Hansen *et al.* (1950).

Allowing for the difference in method our figures are in good agreement with those of Courtice. We are further from those of Cronin (1954), but we feel that he has attempted to place more reliance on his figures than is warranted by an experiment with a single animal. Hansard *et al.* (1953) have carried out a large amount of work on the blood values of farm animals using the isotope dilution methods. We regard their contributions to our knowledge of this subject as of the first importance. We are, however, surprised to note that their counts of the activity of blood were made on whole, untreated blood, by means of an end-window counter. One of us in another connexion (Collery, 1956) has found it impossible to get reproducible results from blood by this method. We believe that the Veall tube is now the standard method of counting the radioactivity of lysed blood in studies of this kind (Reeve, 1952). We think that this difference in method accounts for the fact that our mean figure for ml. of blood per 100 grammes bodyweight, 6.9 is substantially in excess of that obtained by Hansard and his co-workers, 6.2.

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"MR." OR "DOCTOR"?

The following quotations from "Modern Veterinary Practice" may be of interest to readers:—

"British surgeons have been referred to as 'Mister' instead of 'Doctor' since 1540, when the Barber Surgeons' Company was founded. The 'Mister' designation, according to *The Lancet* (1:264, 1957), is an expression of the antagonism aroused by the barber surgeons among the members of the Royal College of Physicians. It dates back to an era when (1) all surgeons were dominated by the physicians, and (2) surgeons had an inferior general education and rarely if ever the degree of doctor of medicine. Dentists and veterinarians in Britain have apparently followed the lead of the surgeons and are also referred to as 'Mister.' Now that the educational standards for physicians and surgeons are the same, many surgeons are protesting against the obsolete and confusing designation. Whether or not dentists and veterinarians are again following their lead is not clear. Certainly on the international scene much confusion could be obviated if professional titles were more nearly universal."

A NEW CANADIAN VETERINARY SCHOOL?

The University of Saskatchewan planning committee has recommended that a prairie counterpart of the Ontario Agricultural College at Guelph be established to supply the future needs of the rapidly growing livestock industry with veterinarians. Professor J. M. Bell, head of the university's animal husbandry department, contends that a veterinary college will have to be provided in western Canada in the near future. The livestock industry, with the backing of the agricultural organisations including the powerful Wheat Pool, is pressing for some early action.

A Field Experiment to Test the Safety of Cyanacethydrazide for the Treatment of Cattle

BY

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SUMMARY.- *100 lactating dairy cattle and 100 store beef and dairy cattle were treated with cyanacethydrazide, on each of 3 successive days. Fifty animals of each class were dosed orally at 18 mg. per kg. up to a maximum of 5.4 gm. per head, the remainder subcutaneously with the 25 per cent. sterile solution at 15 mg. per kg. up to a maximum of 5 gm. per head.*

A very slight effect only was observed in the milk yield of 100 treated lactating animals. A third of 36 store cattle in poor condition showed temporary inappetence after the second treatment, although no effects were seen in 64 store animals in good condition at any stage.

At the doses used there was no difference in effect on appetite, behaviour or milk yield between oral and parenteral treatment.

THE experimental work on cyanacethydrazide* for the treatment of lungworm infestations of domestic animals (Walley, 1957) led to the conclusion that the therapeutic dose for cattle need not exceed 15 mg. per kg. subcutaneously, or approximately 17 mg. per kg. orally, on 3 successive days. The conclusion was also reached that no beast need be given a single dose greater than 5 g. to obtain an adequate anthelmintic effect.

Treatment over 3 successive days is probably necessary only in severe individual cases. Nevertheless, it was decided that this regimen should be tried on a fairly wide scale in an accurately observed experiment. The results would indicate the safety both of this intensive treatment and of the "1st, 5th and 21st day" treatment applicable to outbreaks of parasitic bronchitis in herds and flocks. It is the purpose of this paper to describe the experiment that was done. The work was made possible by the co-operation of Central Agricultural Control of Imperial Chemical Industries Limited, who arranged facilities for beef and dairy cattle to be treated at Dairy House, Lea Hall and Alderley Park farms.

Experimental

Experimental Materials

(1) *Cyanacethydrazide for Injection* †

This was provided as 25 g. of sterile powder in a 100 c.c. sterile vial. Solutions were prepared (the night before or immediately before being used) by adding 80 c.c. of sterile warm (approx. 50° C.) water to each vial. This brought the final volume in the vial to 100 c.c. and gave a 25 per cent. w/v solution.

(2) *Cyanacethydrazide for Oral Treatment* ‡

This was prepared by adding 2-lb. of "Helmox" (equivalent to 90 g. cyanacethydrazide) to 4 pints of water. The final total volume obtained was 5 pints, so that each fluid oz. of the solution contained 0.9 g. cyanacethydrazide.

Experimental Groups

The animals in this experiment were healthy stock in commercial production. They had not been treated previously with cyanacethydrazide.

Three classes of cattle were employed—lactating Ayrshire cattle (100 animals), Ayrshire-store heifers (36 animals) and Friesian and Hereford beef-stores (64 animals). The latter were yard-fed on hay and concentrates. The former two classes were stall-fed, receiving grass-silage alone or with some concentrates. Each class was divided into two, half being treated subcutaneously with "Dictycide" and half orally with "Helmox." In addition, 2 groups of cows were included as controls to the lactating animals in that part of the experiment concerned with the possible effect of treatment with cyanacethydrazide on milk production. Subsequent examination showed that 75 of the lactating dairy cattle were pregnant at the time of treatment. Of the 36 store heifers, 24 were 1 to 3 months pregnant.

In all, 200 cattle received 3 successive daily treatments with cyanacethydrazide. Table I summarises the lay-out of the experiment at the 3 farms involved.

Treatment

Animals were treated between 9 a.m. and 1 p.m. on each day and observed at frequent intervals during the following 9 hours. All were examined on the day following the final dosing. The farm managers concerned reported on the behaviour and performance of treated animals, as also did the stockmen. The latter, however, were not made aware of the nature of the side effects associated with cyanacethydrazide overdosage. By this means it

* U.K. Patent Applications Nos.: 28906/56, 37449/56, 37450/56, 37451/56, 37452/56 and 37453/56.

† "Dictycide." Registered trade mark of Imperial Chemical Industries Limited.

‡ "Helmox." Registered trade mark of Imperial Chemical Industries Limited.

TABLE I
PLAN OF TREATMENTS WITH CYANACETHYDRAZIDE

Group number	Site	Class of cattle	Number in group	Weight range	Bodily * condition	Route of treatment	Dates of treatment
I	Dairy House Farm	Lactating dairy cattle	25	8–10 cwt.	Fair	Oral	12th, 13th, 14th March
II	Lea Head	Store heifers	18	4–6 ,,	Poor	,,	12th, 13th, 14th ,,
III	Lea Hall	Lactating dairy cattle	25	8–10 ,,	Fair	,,	18th, 19th, 20th ,,
IV	Alderley Park	Beef stores	32	5–7 ,,	Good	,,	18th, 19th, 20th ,,
		TOTAL dosed	100				Total Treatments 300
V	Dairy House Farm	Lactating dairy cattle	25	8–10 ,,	Fair	s/c. inj.	12th, 13th, 14th March
VI	Lea Head	Store heifers	18	4–6 ,,	Poor	,,	12th, 13th, 14th ,,
VII	Lea Hall	Lactating dairy cattle	25	8–10 ,,	Fair	,,	18th, 19th, 20th ,,
VIII	Alderley Park	Beef stores	32	5–7 ,,	Good	,,	18th, 19th, 20th ,,
		TOTAL dosed	100				Total Treatments 300
IX	Dairy House Farm	Lactating dairy cattle	28	8–10 ,,	Fair	Undosed controls in milk yield experiment	—
X	Lea Hall	Lactating dairy cattle	14				—
			42				

* The comments in this column refer to an absolute standard and not to the standard of condition necessarily most desirable for an animal of a particular class. In this latter sense there is a wide difference between " good condition " in beef and dairy cattle.

was possible to keep their observations free from subjective influences. These observations and our own are combined under the heading " Results."

(*i*) *Subcutaneous injection*

(*Groups V—VIII inclusive*)

Each animal received 3 c.c. of 25 per cent. w/v solution per cwt. bodyweight up to a maximum of 20 c.c. This dose is equivalent to 15 mg. per kg. up to a maximum of 5 gm. for animals of 330 kilos and over.

The dairy cattle and store heifers were not weighed but were approximately 8 to 10 cwt. and 4 to 6 cwt. respectively. All the beef stores were weighed at the time of treatment and as in the previous cases dosed to the nearest half cwt.

(*ii*) *Oral treatment*

Dosage was at the rate of 1 fl. oz. of prepared solution per cwt. bodyweight, up to a maximum of 6 oz. (equivalent to 18 mg. cyanacethydrazide per kg. up to a maximum of 5.4 gm. for animals of 300 kilos and over) in Groups I and II. In Groups III and IV the maximum doses were slightly less, *viz.* 5½-oz. (equivalent to 4.95 gm. for animals of 275 kilos and over). The arrangements for weight assessment were the same as in the " subcutaneous treatment " groups, all animals being dosed to the nearest half cwt.

Results

Group I

One animal showed slight tremor of the hind limbs 30 minutes after receiving its first dose. There was no loss of appetite. Her milk yield fell from 19½ to 16½ lb. for the 24 hours after the first treatment. No effects were seen at all after the second and third doses, when the yield returned to 19½ lb. No other animal showed any effect at any time, except possibly a slight (less than 5 per cent.)* diminution of milk yield.

Group II

Six animals of this group of 18 showed some slight inappetence and depression after the third dose. They returned to normal feeding the day after treatments ceased. No tremor or inco-ordination was observed, the animals being inspected, at intervals, up to 9 hours after each dose.

Group III

No adverse effects on appetite or behaviour were observed during and after test. The milk yield was very slightly depressed.

Group IV

No adverse effects on appetite or behaviour were observed during and after test.

Group V

No adverse effects on appetite or behaviour were observed during and after test. The milk yield was very slightly depressed.

Group VI

Effects similar to those seen in Group II were observed.

Group VII

No adverse effects on appetite or behaviour were observed during and after test. The milk yield was very slightly depressed. Four cattle showed slight oedema at the site of injection following the second treatment. The third injection was applied close to the affected region. The swellings were reported

* See Discussion.

to have increased in size by the afternoon of the third day, but disappeared within 2 to 3 days, without treatment.

Group VIII

No adverse effects on appetite or behaviour were observed during and after test.

There were no abortions among the pregnant animals treated within the subsequent 2 months' observation period.

Table II summarises the observations.

TABLE II

EFFECTS OF TREATMENTS WITH CYANACETHYDRAZIDE ON THE VARIOUS GROUPS

	Number of animals	Route	Remarks
		100 Dairy Cattle	
Gp. I	25	Oral	1 cow slight tremor on one occasion.
Gp. V	25	Inj.	No effects.
Gp. III	25	Oral	No effects.
Gp. VII	25	Inj.	4 cows slight local reaction. No systemic effects.
		100 Store Cattle	
Gp. II	18	Oral	5 heifers showing temporary dullness after 3rd treatment.
Gp. IV	32	Oral	No effects.
Gp. VI	18	Inj.	6 heifers showing temporary dullness after 3rd treatment.
Gp. VIII	32	Inj.	No effects.
	200		

In lactating animals, treatment produced a slight (less than 5 per cent.) depression in milk yield, lasting 12 to 24 hours. The effect was most noticeable in the high yielding cows.

Discussion

Variations in milk yield of lactating dairy cattle are a delicate measure of metabolic changes brought about by alterations in such factors as diet, management and disease. Cyanacethydrazide is a convulsant at high dosage and depresses appetite at somewhat lower doses. The absence of any marked effect on milk yield during this test, even after 3 successive daily doses at therapeutic level offers strong evidence of the low toxicity of cyanacethydrazide, in the dosage used, in dairy cattle. It is widely accepted that disturbances of routine of dairy cattle depress milk yield and ideally the effects of handling cattle and administering the drug should also have been controlled. It is concluded, therefore, that the effects of cyanacethydrazide on yield may

(*Concluded at foot of adjoining column*)

be less even than appears from this experiment.

The slight symptoms of a temporarily depressed appetite in a minor proportion of animals in poor condition after repeated subcutaneous or oral doses cannot be a cause for serious concern. When treating diseased animals, especially in poor physical condition, care must, of course, be taken (see Walley, 1957).

Acknowledgments.—The advice and assistance of several colleagues, and of the staff of the farms on which the trials took place is gratefully acknowledged.

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Current Literature

BOOK REVIEWS

Veterinary Meat Inspection. F. SCHONBERG and O. ZIETZSCHMANN. 5th Ed., 1958. Paul Parey, Berlin and Hamburg. 343 pages, 181 text figures, 8 colour plates. Price 41 DM.

This book begins with a section of 74 pages devoted to a description of the lymphatic system of the pig, ox, and horse, contributed by Professor Zietzschmann, Professor of Anatomy in the Veterinary School at Hanover. Professor Zietzschmann died in the autumn of 1957, just as the book was leaving the publishers. The rest of the book consists of two parts. The first deals with *ante-mortem* and *post-mortem* inspection of animals used for food in Germany, including the goat, horse, and dog. The last is hardly ever eaten nowadays, but in some parts of the country the meat and particularly the fat of dogs is used as a "cure" for various diseases, and so the legislation dealing with meat inspection includes a section dealing with dogs.

The second part reprints in small type the Meat Inspection Act of October, 1940, and the rules and regulations for its interpretation in abattoirs.

Since the book is intended primarily for veterinary meat inspectors, the text is naturally closely related to the legislation concerned. The many excellent illustrations, including the colour plates, are a valuable feature of the book and it is natural that a high proportion of them deal with parasites such as Trichinella, which are a particular problem in Germany. The new edition has been extensively revised, particularly the sections dealing with emergency slaughter and with the judgment of tuberculous animals.

The book is really a text-book of veterinary pathology as applied to meat inspection, although there is also a section on the bacteriological examination of meat, and a table giving the antigenic structure of Salmonella. The book is designed as a guide for the veterinary meat inspector in the detection and judgment of diseased meat.

The publishers have maintained the usual high standard of text, illustrations, and binding, and the book is reasonably priced.

Three other German meat inspection books which, with the one reviewed here, cover the whole field of food hygiene, are: Bacteriological Meat Inspection, by Standfuss (4th Ed., 1952); Veterinary Food Control, by Schönberg (6th Ed., 1953); and Textbook for Meat Inspectors, by Goerttler (22nd Ed. of Ostertag's original book, to appear in 1958). The large veterinary staff concerned with meat inspection and hygiene in Germany and other European countries are thus well supplied with authoritative text-books.

All who can read German and are concerned with meat hygiene and inspection will find a wealth of information in Professor Schönberg's book, and an example of the minute detail of veterinary meat inspection law in Germany, in marked contrast to the much more general advice given in this country by Memo. 3/Meat. The German and British systems have evolved along quite different paths. The former is concerned with protecting a public which eats much uncooked and partially cooked meat by providing detailed veterinary *ante-mortem* and *post-mortem* inspection to detect particularly such diseases as tuberculosis, trichinosis, and salmonellosis. At the same time all meat and offal that can safely be consumed is sold, some of it at a lower price through the Freibank after heat treatment. The British system aims at securing safe and wholesome meat by mainly non-veterinary public health inspectors under the control of Medical Officers of Health, almost entirely by macroscopic inspection, followed by condemnation of all that is or might reasonably be assumed to be potentially unsound.

Textbook of Meat Inspection. J. DRABBLE, B.V.SC. (6th revised edition.) Angus & Robertson Ltd., 1956. Pp. 414. £3 15s.

This book has evolved from the courses of lectures given by the author to lay meat inspectors in Australia, but it contains much of interest to all concerned with meat inspection, for it deals with conditions which may be encountered throughout the world; it will be of particular help to those who have the task of educating lay personnel, since a syllabus of instruction could be formulated on its contents.

Part I, which occupies nearly one-half of the text, begins with advice on study and sitting for examinations, followed by chapters on the elementary facts concerning veterinary anatomy and physiology. Part II deals with food animals and slaughtering, a résumé of the history of meat inspection, preservation of meat, laboratory notes and glossaries of trade and technical terms, as well as pathological conditions and the codes of inspection.

The many illustrations are of excellent quality, but one cannot help feeling that they are perhaps not too well balanced in relation to the actual incidence of diseases met with in routine inspection. For example, no fewer than 23 photographs of malignant tumours are reproduced whilst tuberculosis is represented by only 8 photographs. Also, the photographs are distributed throughout the text without any attempt at correspondence with the text.

Nevertheless, it is eminently suitable as an introduction to the subject, and will be of particular value to students from the meat and allied trades who are so frequently in need of guidance in such matters.

Meat Hygiene. Published jointly by the Food and Agriculture and the World Health Organisations of the United Nations, as the World Health Organisation Monograph Series No. 33 (1957). Obtainable from H.M. Stationery Office. Pp. 527, two coloured plates and numerous illustrations. 45s.

This monograph contains the contributions to the Seminar on Meat Hygiene held in Copenhagen in February, 1954. These have been brought up to date and extended where necessary, with certain other additional information.

"This monograph is not intended to serve as a guide or to train those responsible for supervising the soundness of meat from the producer to the consumer. . . . Its aim is, rather, to illuminate recent advances and problems in diverse aspects of this wide subject for the benefit of the responsible authorities in public health and in veterinary science."

Chapters are included on meat-borne diseases, *ante-mortem* care and slaughtering of animals, *post-mortem* inspection and judgments, the application of bacteriological and biochemical tests, the processing and marketing of meat, surveys of practices in Europe and the tropics and the training of meat inspectors.

No fewer than 46 pages are devoted to appendices containing information on subjects ranging from meat consumption in various lands, transport regulations, design of abattoirs, food-poisoning outbreaks and control methods, and the meat regulations in force in Denmark and Kenya.

An extensive select bibliography, compiled from world sources, gives the most important references to matters published on meat inspection and related subjects. This alone might well justify the monograph.

Readers who have an intimate knowledge of conditions in this country cannot fail to draw the inevitable conclusion that, whilst in many lands well organised meat inspection services have developed into the practice of a well developed science, here they remain, by comparison, little better than a crude art or craft.

Nevertheless, despite the lack of development and appreciation by our legislature of the need for a realistic and scientific approach to this aspect of public health, it is pleasing to note that 3 of the 16 articles were contributed by 2 members of the Royal College of Veterinary Surgeons in this country.

We confidently recommend this work to medical officers of health and all those who wish to gain an appreciation of the scope of a well organised meat-inspection service, as well as to those who are actively engaged in supervising these services or teaching the subject in our Universities.

There is a criticism which the reviewer cannot suppress. The book is well printed on good paper and the illustrations are well produced. However, the pages are contained within a paper cover, which does not survive frequent handling. In view of the

price, it is suggested that the purchaser deserves a better and more durable cover to what is a well compiled book of reference.

The Pig Farmer's Veterinary Book. NORMAN BARRON, M.R.C.V.S., B.SC. (2nd edition.) Dairy Farmers (Books) Ltd., Ipswich. 1957. Pp. 143. 16s.

Pig keeping is an enterprise which, like any other industrial undertaking, thrives or fails according to its efficiency. Among the biggest stumbling blocks to efficiency in present-day pig keeping are the diseases, ill health and chronic disabilities from which the animals suffer. The annual toll in terms of money and effort is very heavy, and any step leading to improvement in this sphere is certainly most welcome. Dr. Barron deserves the industry's gratitude for summarising in a concise and popular fashion the existing knowledge in this field.

To the reviewer, who is not a member of the veterinary profession, perhaps the biggest shortcoming of this commendable handbook is the attempt to provide clear-cut answers and advice, even in cases where these would appear to be impossible, owing to the lack of sound knowledge concerning a particular disease entity. It must be an unenviable task for a veterinary surgeon to be called to a piggery when pigs are ill or even dying, and when due to lack of scientific investigations he can do no more than " his best," which sometimes succeeds and sometimes does not in alleviating the condition. An even less enviable task is to deal with these matters in black and white, and Dr. Barron's courage in writing this popular book is most commendable. Even more commendable is the fact that he has found a satisfactory way of breaking through the professional boundaries to bring popular advice directly to the pig keeper. In so doing he has done good service both to his profession and to the industry which it serves. By acquainting the pig keeper with facts concerning the diseases of pigs, he has made the task of the veterinary surgeon easier.

The book is well written and well produced, with excellent photographs and informative sketches and diagrams. The " Disease Diagnosis Chart " and the " Anatomy of a Pig " plate in front of the book, and the " Veterinary Cupboard " and an Index at the end of the book, are most valuable. In spite of some minor shortcomings and mistakes, which one cannot mention in a short review, the book meets a current need and no doubt will have a wide circulation.

Dogs of Character. KATHE KNAUR and MARGA RUPERTI. Macdonald. 30s.

This book, half text, half photographs, is a beautifully produced volume describing the history, character, and looks of 20 breeds of dog.

The choice of breeds is varied to include some of the lesser-known European types, such as the Swiss Mountain dog, in addition to several of the popular breeds in this country.

The style of the text is anecdotal, and although much of it, particularly the history, is of absorbing interest, it appears, in trying to please all tastes, to fall between two stools.

It does not quite reach the stature of a full, authoritative work for the serious student of dogs, nor, on the other hand, does it quite fall into the mass of sentimentalised anecdotage churned out for the animal lover as each Christmas approaches.

The photographs concentrate largely on facial expressions though the captions bring to notice some of the points desired by breeders in the dogs shown.

This obsession with faces has its disadvantages since it fails, in many cases, to give any impression of the size, build, and general type of the various breeds, and in some photographs, in particular in one of those showing an Irish Setter, the foreshortened impression of the fore legs and body which is given would be utterly misleading to one who was not familiar with the aesthetic pleasure to be derived from seeing the whole dog in action.

If the authors intend, as they say they do, to cover more breeds in a companion volume it is to be hoped that they will recollect that " Dogs of Character " may be revealed in their stance, the set of their tails, and in their working actions and environment as well as their expressions. Many of the specimens photographed are not, from the show point of view, particularly typical. This doubtless sounds a minor criticism in a book on character, but with a little more accuracy and care the next book could rise to giving much more pleasure to the aesthete and the breed fancier as well as the sentimentalist among dog lovers and be more worthy of its lavish production.

Horses in Fact and Fiction. An anthology compiled and edited by AKE RUNNQUIST. Jonathan Cape, 1957. 35s.

This is a beautifully produced book, in which the reader is entertained by a remarkable series of tales about horses of all lands and all times. They have been arranged in logical sequence, beginning with facts about the prehistoric horse, and including, among others, " The Great Steeplechase," by Leo Tolstoy, in which one really rides the race with the hero, and one that I particularly like called " A New Horse." There are 24 superb illustrations, including 8 colour plates from paintings by Velasquez, Rubens, Pisanello, Gericault, Degas, Toulouse-Lautrec, George Stubbs and H. Alken.

A book to keep in one's library, and one that will give pleasure at any time ; I could not put it down.

Owing to the large number of books offered for review, a further book section will be published next week. Customarily our book review feature appears on the second Saturday of each month. Owing to the pressure on our space, Abstracts have had to be held over temporarily.

News and Comment

REPORT OF THE ANIMAL HEALTH SERVICES, 1956*

Government reports are not usually regarded as entertaining reading but to veterinary surgeons this one is fascinating. In some ways it can be regarded as a survey of the state of the nation's animals. The Report is much more than a stocktaking of those conditions covered by the Diseases of Animals Act, 1950 (Parts I and II and Part V), which contains the reports of the laboratory research and investigation services, gives information bearing on almost every disease of economic importance in farm animals.

In some respects 1956 was a very difficult year for the veterinary field staff of the Ministry of Agriculture. There were 162 outbreaks of foot-and-mouth disease, some of which were difficult to control as they involved stock, particularly sheep, on the common grazings of the Forest of Dean. Thirty-two of the outbreaks were regarded as primary and yet again the majority were associated with imported meat, their products or wrappings.

Anthrax also showed a marked increase. There were 1,245 outbreaks, the highest annual total since 1910. Yorkshire was particularly affected, providing 444 outbreaks towards the total. The Report suggests that many of the outbreaks resulted from the feeding of concentrated foods containing contaminated imported materials.

Fowl pest continued to be a problem, with 956 outbreaks, which was 50 more than in the previous year. Well over half these outbreaks occurred in Lancashire.

The Attested Herds Scheme and the Area Eradication Plan for bovine tuberculosis continued to make very satisfactory progress, with 67 per cent. of all the cattle in the country attested by the end of the year. (This statement has been amplified to-day, February 27th, 1958, by an announcement in the press that the Ministry of Agriculture plan to make the whole country an attested area for cattle by 1961.)

Swine fever outbreaks were reduced to a little more than half of the previous year's total.

There is a variety of interesting and informative material in Part V. Among other important sections which reasons of space preclude more than their mention, are reports on brucellosis, vibriosis, Johne's disease, tuberculosis, bovine mastitis, lungworm disease, parasitic gastro-enteritis, swine fever, and the mucosal disease complex.

The Report can usually be relied on for some piece of unusual information, and the 1956 highlight was that the unusual mortality in pheasants and woodpigeons was probably due to poisoning following the eating of seed corn that had received a chemical dressing which included dieldrin.

The price of the Report is 6s., which the reviewer considers to be one of the best bargains on the veterinary literature market.

* Report on the Animal Health Services in Great Britain, 1956. Ministry of Agriculture, Fisheries and Food. Department of Agriculture for Scotland. London, H.M.S.O. 6s.

THE BRITISH TURKEY FEDERATION

The Federation have just held their seventh annual conference which took place this year at Harrogate. It was attended by several members of the profession; Dr. R. F. Gordon was a member of a panel speaking on research requirements in the turkey industry, and others present were Dr W. P. Blount of B.O.C.M., Mr. Henderson of the Distillers Co. Ltd., and Dr. W. M. McKay of Cyanamid of Great Britain Ltd. Dr. McKay, who has been a member of the management committee since the inception of the Federation, was chairman of the main paper, given by Dr. Sterling Brackett, who spoke on "The Development of Products for the Control or Prevention of Diseases and Improvement in Production of Turkeys."

Some 380 members and guests attended the annual banquet. The principal speaker was Mr. J. N. Ritchie, C.B., Chief Veterinary Officer, who proposed the toast of the British Turkey Federation.

AREA ERADICATION PLAN FOR TUBERCULOSIS

The Minister of Agriculture intends to extend the free tuberculin testing of cattle to the remaining parts of the country and, on March 1st, 1960, to declare the two final areas of England as Tuberculosis Eradication Areas. There is a good prospect that the whole of Great Britain will be an Attested Area by 1961.

At the end of 1957, there were in Great Britain 7,500,000 cattle in attested herds and Attested Areas compared with 2,000,000 in October, 1950, when the Area Eradication Plan was introduced. Approximately 76 per cent. of cattle in Great Britain are now attested (England 70 per cent., Wales 93 per cent., and Scotland 92 per cent.), and nearly a third of all cattle in Great Britain are now in tuberculosis Attested Areas.

The areas referred to above are: Northumberland and the remainder of Durham; Cheshire, Derby, Huntingdon, Isle of Ely, Leicester, Lincoln, Nottingham, Rutland, Soke of Peterborough, Stafford, Yorks (East Riding), and the remainder of Lancashire, Northampton, Warwick, and Yorks (North and West Ridings).

WYE COLLEGE POST-GRADUATE COURSE IN POULTRY SCIENCE

Wye College has instituted a two-year post-graduate course in poultry science leading to the M.Sc. degree of the University of London. The first course will start in October, 1958. It will be open to graduates in agriculture, and to graduates in veterinary science, zoology, and other relevant sciences.

Applications should be made before July 15th, although late applications up to September 15th may

be considered. Candidates who are sitting final examinations for their first degree in 1958 should make provisional application before July 15th and inform the College of their examination results as soon as possible. Application forms and an extended syllabus of the course may be obtained from the Registrar, Wye College, Near Ashford, Kent.

SOUTHERN COUNTIES VETERINARY SOCIETY

An informal party was held at the Polygon Hotel, Southampton, on February 26th, by the Southern Counties Veterinary Society. It was for one of its honorary Fellows, Mr. George Gould, to celebrate his attaining the office of President of the Royal College of Veterinary Surgeons. Champagne cocktails, enjoyed by 45 guests, prefaced the presentation of a framed caricature of this noted veterinary surgeon, a member of the Society for some 34 years. The caricature (reproduced by permission) was drawn

by the *Punch* cartoonist Ray Evans. A bouquet of specially chosen carnations was presented to Mrs. Gould.

In a brief speech, the President of the Southern Counties Veterinary Society, Mr. Richard Hartley, mentioned the Society's pride in having such an eminent veterinary surgeon as a member, and wished him every good fortune for his coming journey to the West Indies and the U.S.A.

After the ovation that followed, Mr. Guy Anderson of Aylesbury, as invited speaker, achieved a happy compromise between levity and seriousness in his talk on Practice Organisation. The vigorous discussion which followed brought the evening to a close, the speaker being complimented on the admirable way in which he had dealt with his subject.

PERSONAL

Dr. R. D. Brown, B.A., B.SC., has been awarded the Doctorate of Veterinary Medicine and Surgery in the University of Edinburgh. This is the first award of this senior degree, which is comparable with the M.D. in medicine. The degree was instituted in 1952. Dr. Brown's thesis was entitled "Rinderpest Immunity in Calves."

Births

BRUNSDON.—On February 26th, 1958, to Jean, wife of J. R. Brunsdon, M.R.C.V.S., of 60, Hill Head, Glastonbury, Somerset, a daughter, Fiona Jill, sister for Paul.

CROFT.—On February 26th, 1958, at Leamington Spa, to Pauline, wife of David C. Croft, B.V.SC., M.R.C.V.S., a daughter, Hilary Rachel, sister for Simon.

CURTIS.—On March, 3rd, 1958, to Marian, wife of Peter Curtis, B.V.SC., M.R.C.V.S., of 16, Haslin Crescent, Christleton, Chester, a daughter.

FRANKS.—On March 1st, 1958, at Colchester Maternity Home, to Sally (*née* Reid), wife of Peter Franks, M.R.C.V.S., a son, Philip William.

MANTON.—On March 3rd, 1958, to Helen, wife of V. J. A. Manton, M.R.C.V.S., of 37, Hicks Lane, Girton, Cambridge, the gift of a brother, Michael Christopher Paul, for Frances.

TURNER.—On February 27th, 1958, to Magdalen, wife of Roger Turner, M.R.C.V.S., 50, Grove Road, Hitchin, a daughter, Marianne Ruth, sister for Rosslyn and Neil.

COMING EVENTS

March

19th (Wed.). Meeting of the Section of Comparative Medicine, Royal Society of Medicine, at the Society's House, 5 p.m.

19th, 20th and 21st (Wed., Thurs. and Fri.). Committee and Council Meetings of the Royal College of Veterinary Surgeons.

20th (Thurs.). Annual General Meeting of the East Midlands Division at the School of Agriculture, Sutton Bonington, 2.15 p.m.

26th (Wed.). Annual General Meeting of the Scottish Metropolitan Division in the Royal (Dick) School of Veterinary Studies, 2.30 p.m.

27th (Thurs.). Annual General Meeting of the Western Counties Veterinary Society at the Rougemont Hotel, Exeter, 2.15 p.m.

28th (Fri.). Annual Dinner-Dance of the East Midlands Division at the George Hotel, Nottingham, 7 p.m.

April

2nd (Wed.). 20th Ordinary General Meeting of the A.V.T. & R.W.'s at Derby Hall, North Mossley Hill Road, Liverpool, 18, 10.25 a.m.

9th, 10th and 11th (Wed., Thurs. and Fri.). B.V.A. Committee and Council Meetings at the Royal (Dick) School of Veterinary Studies, Edinburgh.

12th (Sat.). 12th Annual Dinner of the B.R.X. Club at the Royal Veterinary College, 6 p.m.

25th (Fri.). General Meeting of the Mid-West Veterinary Association at the Berkeley Café, Clifton, Bristol, 2.30 p.m.

BRITISH VETERINARY ASSOCIATION QUARTERLY MEETINGS IN EDINBURGH

Wednesday, April 9th—Royal (Dick) School of Veterinary Studies

10.15 a.m. Small-Animals Committee.

2.15 p.m. Home Appointments Committee.

3.45 p.m. Farm Livestock Committee.

Thursday, April 10th—Royal (Dick) School of Veterinary Studies

9.30 a.m. Finance Sub-committee.

10.00 a.m. Veterinary State Medicine Committee. Committee.

11.30 a.m. Parliamentary and Public Relations Committee.

2.30 p.m. General Purposes and Finance Committee.

Friday, April 11th—Royal (Dick) School of Veterinary Studies

10.15 a.m. Council Meeting.

ADDRESSES OF DISEASE INFECTED PREMISES

The list given below indicates, first the county in which are situated the premises on which disease has been confirmed, followed by the postal address and date of outbreak.

Anthrax

Dorset. Trapdoor Farm, East Orchard, Shaftesbury (Feb. 26).

Lancs. High House Farm, Claughton, Garstange, Preston (Feb. 24).

Norfolk. Fiddlers Hill Farm, Wighton, Wells-next-the-Sea (Feb. 24).

Perths. East Leys Farm, Errol (Feb. 24); Millhaugh, Dunning (Feb. 26).

Salop. Hall Farm, Minsterley, Shrewsbury (Feb. 24).

Atrophic Rhinitis

Cambs. Hillhouse Farm, West Dalton, Wisbech (Feb. 27); 10, Council House, Silver Street, Upwell, Wisbech (Mar. 2).

Foot-and-Mouth Disease

Hants. Cold Manor Farm, Whitchurch (Feb. 28); May Hill Farm, Swanmore, Southampton (Mar. 1).

Northants. Dukes Arms Farm, Grafton Underwood, Kettering (Mar. 2).

Somerset. Grove Lodge Land, North Cheriton, Templecombe (Feb. 24).

Sussex. Beech Farm, Cuckfield, Haywards Heath (Feb. 27).

Fowl Pest

Lancs. Diamond Hall, Woodhouses, Ashton-under-Lyne; Hawthorn Bee Lane, Penwortham, Preston (Feb. 26); Sandy Lane, Mawdesley, Ormskirk; Hollowforth Farm, Woodplumpton, Preston (Feb. 27); Wrainhow Mount Farm, Lewth Lane, Woodplumpton, Preston (Feb. 28).

Surrey. 79, Little Woodcote, Wallington (Feb. 24).

Swine Fever

Ches. Outwood Farm, Heald Green, Cheadle (Feb. 27).

Derbys. 72, Brown Edge Road, Buxton (Feb. 28).

Dorset. The House in the Wood, Merley Park Road, Ashington, Wimborne (Feb. 25); Martins Farm, Woodlands, Verwood, Wimborne (Feb. 27).

Herts. 12, Worcester Road, Hatfield (Feb. 27).

Glas. High Barrwood Piggeries, Kilsyth (Feb. 24).

Kent. 56, Hastings Road, Bromley (Feb. 24).

Leics. Holmes Farm, Lubenham, Market Harborough (Feb. 24); Hartfield Lodge Farm, Baggrave, South Croxton (Feb. 26).

Oxford. Penn Farm, Towersey, Thame (Feb. 27).

Staffs. 59, Oldbury Road, Smethwick (Feb. 26).

Wilts. Fleet Cottage, Wedhampton, Devizes (Feb. 28).

Worcs. Acton Farm, Ombersley, Droitwich (Feb. 28).

Yorks. Moathill Farm, Birstall, Leeds (Feb. 24).

CORRESPONDENCE

The views expressed in letters addressed to the Editor represent the personal opinions of the writer only and their publication does not imply endorsement by the B.V.A.

The Feeding of Poultry

Sir,—I have noticed a little controversy in your columns of late regarding the home-mixed food *versus* proprietary food for poultry. One correspondent states he used 282 tons of proprietary growing foods, and then leads one to believe that this was not in the best interests of the stock.

Without indulging in any scientific discourse I would merely like to add that my firm uses between 2,000 and 2,500 tons of poultry food annually, and it is all a proprietary brand now—we used to mix our own. Further to this we keep a few breeding birds, produce a few chicks and, being Yorkshiremen, the economics of the business are not entirely forgotten.

Yours faithfully,
W. E. BEATTIE.

Square Works,
Mytholmroyd,
Halifax,
Yorkshire.

March 1st, 1958.

R.C.V.S. Elections

Sir,—In support of Dr. Rankin's letter regarding the coming elections, I for one will cross out the names of all who have been members of the Editorial Committee of THE RECORD, because we certainly want a new lot of scrutineers.

Yours faithfully,
G. C. LANCASTER.

Eastwick House,
Evesham,
Worcs.

March 1st, 1958.

Use of Bovine Serum Albumen

Sir,—We read with interest a series of articles published by Dr. A. M. Harthoorn in your journal during 1953 in which he described the use of pure concentrated bovine serum albumen in the treatment of shock. The physiological data in these articles was most valuable particularly regarding the use and misuse of saline and plasma substitutes.

We have been rather surprised, therefore, that this subject does not appear to have been followed up, and we have so far not encountered any commercial source of bovine serum albumen.

In default of this agent we have for the past year employed normal seitz filtered bovine serum in cases of severe shock in sheep, goats, dogs, and cats at an initial intravenous dosage of 40 to 60 ml. for sheep and 10 to 40 ml. for dogs and cats, repeated if necessary at about two-thirds of the original dosage after 6 to 12 hours. In animals showing signs of dehydration this treatment is supplemented by subcutaneous injections of glucose-saline to effect expansion of the blood volume.

The same line of treatment is potentially useful also in the later stages of systemic disease when an animal may have commenced producing its own antibodies but is in such a collapsed and dehydrated condition that it will die if left alone. Recently we have used intravenous serum and subcutaneous glucose-saline in these cases and have found this to be much superior to anything tried previously. We hope one day to publish clinical details of some representative cases, but generally the results of intravenous bovine serum treatment have been very satisfactory.

Bovine serum is usually readily obtainable and has the advantage of being relatively cheap. In our experience if kept frozen in round, screw-capped bottles in an ice-cream refrigerator it may be stored without deterioration. We find bottles of 20 ml. capacity are convenient in that they may be thawed rapidly and the danger of using the same bottle several times is avoided. The main difficulty in practice is probably that of storing reserve stocks, but this could probably be solved often by arrangement with a local ice-cream or frozen-food store.

Failing a ready and economic source of dried bovine albumen we believe intravenous serum therapy provides a good substitute and is worthy of record.

Yours faithfully,
R. W. CROWTHER.
M. A. PETRIS.

Government of Cyprus Veterinary Service,
Nicosia,
Cyprus.

February 26th, 1958.

References

HARTHOORN, A. M. (1953). *Vet. Rec.* **65**. 35.
———. (1953). *Ibid.* **65**. 51.
———. (1953). *Ibid.* **65**. 70.

Raising the Recumbent Cow

Sir,—All practitioners will have met the problem of the recumbent cow—in particular, the cow which has recovered from milk fever, but has lost the desire to stand. Slinging the cow is useless, and very often an animal is lost because of its refusal to rise.

Now, however, a very simple lifting device, the "Bagshawe Cattle Hoist," has been put on the market. This has been patented by a client of ours, and after trying it on several stubborn cases, we have found it extremely useful.

After clamping the device over the iliac protuberances and screwing it firmly into position, one is left with a cow having the equivalent of a suitcase handle on its back. This can be lifted with pulleys and the cow raised into the standing position. The clamping of the pelvis in no way prevents free use of the hind limbs, and if necessary the cow may be left suspended for an hour at a time without skin damage. Using a dead subject we have found it impossible to break the pelvis.

The only difficulties with the hoist are those of applying to very fat animals and occasional resentment of its application. The latter has only occurred twice in our experience.

Yours faithfully,
V. A. HARRISON

Derwent,
Church Street,
Matlock.

March 2nd, 1958.

Vibriosis in Bulls

Sir,—The letter on the above subject in your issue of February 15th, 1958, indicates that your correspondent is not clear as to the objects of the investigations recently reported in THE VETERINARY RECORD. These were not to demonstrate, through the medium of artificial insemination, that *V. fetus* was capable of causing infertility and abortion but to study the diagnosis and treatment of *V. fetus* infection in bulls.

The additional information asked for by your correspondent could, in part, be supplied although collection of the data would present difficulties as the bulls concerned were not standing at one A.I. centre and, to be of value, the information would

have to be supplied in great detail. Some of the information requested (*e.g.* the incidence of abortion and the comparison between natural service and A.I. conception rates in herds) could not now be obtained with any degree of accuracy. However, it is suggested that much of the information required is irrelevant to the points which your correspondent appears to have in mind. The following explanations, which are both relevant and important, should help to clarify the situation:—

(1) The investigations, to which reference was made, were based on the acceptance of the fact that the organism, defined as *V. fetus*, can be spread in infected semen with resultant infertility and/or abortion in cattle. This has been accepted by informed veterinarians throughout the world and there is no evidence to the contrary.

(2) The practice of adding an antibiotic or a combination of antibiotics to semen diluents is now almost universal and, as a result, some bulls give normal conception rates when used in the routine A.I. service but, without antibiotics, these bulls exhibit lowered fertility. Since this occurs with *V. fetus* infected bulls, such bulls cannot be expected to show an appreciable increase in conception rate after successful treatment for *V. fetus* infection. The conception rates before and after treatment of one such bull were:—

Period	First Inseminations	Non-return Conception Rate
Before treatment (9 months)	1,672	57.6 per cent.
After treatment (9 months)	1,611	59.9 per cent.

Conception rates, based on pregnancy diagnosis of maiden heifers inseminated with *V. fetus* infected or *V. fetus* free semen, with or without streptomycin, further illustrate the point made above:—

Bulls used for first insemination	Streptomycin in diluent		No Streptomycin in diluent	
	No. of heifers	Percentage pregnant	No. of heifers	Percentage pregnant
V. fetus-free (7)	230	56.5	161	50.3
V. fetus-infected (2)	82	52.4	68	22.1

(3) Experimental work by Lawson (1954) and Morgan, Melrose and Stewart (1957) has shown that a proportion of heifers inseminated with *V. fetus* infected semen in the usual egg-yolk citrate diluent containing antibiotics became infected with *V. fetus*.

(4) As a result of the significant improvement in conception rates of infected bulls by adding antibiotics to the semen diluent, it is obvious that, provided a given herd is using A.I. only, the risk of spreading infection within the herd will be small and the conception rate will be reasonably normal. If, however, a bull happens to be used by natural service at a later date in the herd in which an occasional animal may have become infected through A.I., then there is a real risk of an oubreak of vibriosis occurring in such a herd.

(5) Since satisfactory conception rates continue to be reported by the A.I. organisations, the chance of spreading *V. fetus* through insemination using the present techniques must be small, but the writers are of the opinion that A.I. centres should take all possible steps to eliminate the risk completely. This can only be done by ensuring that all bulls are free from this infection; this includes the treatment of infected bulls and test mating to show that these and other bulls are free from the infection. It was with this aim that the investigations reported on recently in THE VETERINARY RECORD were made.

Yours faithfully,

D. L. STEWART,
DAVID R. MELROSE,
W. J. BRINLEY MORGAN.

Reading Cattle Breeding Centre,
Shinfield,
Reading.

March 4th, 1958.

References

LAWSON, J. R. (1954). Report on F.A.O. Meeting on Bovine Infertility, Copenhagen.

MORGAN, W. J. B., MELROSE, D. R., & STEWART, D. L. (1957). *Vet. Rec.* **69**. 1,429.

ADVERTISER'S ANNOUNCEMENT

BURROUGHS WELLCOME & Co. announce that they have made arrangements whereby veterinary products which are likely to be required in emergency can now be obtained from John Bell & Croyden, Ltd., 50-52, Wigmore Street, London, W.1. (Tel.: WELbeck 5555). This emergency service is limited to week-ends and public holidays.

DISEASES OF ANIMALS ACT, 1950—GREAT BRITAIN
Summary of Returns of Confirmed Outbreaks of Scheduled (Notifiable) Diseases

Period		Anthrax	Atrophic Rhinitis	Foot-and-Mouth	Fowl Pest	Sheep Scab	Swine Fever
1st to 15th February, 1958		7	—	36	32	—	33
Corresponding period in	1957	19	2	1	37	—	39
	1956	171	1	—	15	—	20
	1955	58	—	—	26	—	57
1st January to 15th February, 1958		22	—	79	152	—	139
Corresponding period in	1957	51	2	11	162	—	109
	1956	288	1	—	112	—	78
	1955	151	—	5	111	—	140